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# EFFECTS OF ACTIVE AND PASSIVE RECOVERY ON SELECTED PHYSIOLOGICAL VARIABLES AMONG HOCKEY PLAYERS

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## Abstract

*Post exercise recovery occurs after the cessation of exercise and it is related to the removal of metabolic by-product, the replenishment of energy store, the initiation of tissue repair. The purpose of this study was to compare the effect of active (low intensity running and static stretching) and passive recovery (supine lying position) on the physiological variables namely heart rate, respiratory rate, systolic and diastolic blood pressure among hockey players. Total 10 male intervarsity hockey players of 18 to 23 years old from L.N.I.P.E Gwalior (M.P), (5 for each group) were selected as subjects for this study. The physiological variables were measured with the following procedure: respiratory rate were measured manually from thoracic region (breath/minutes), heart rate with heart rate monitor (beat/ minutes) and blood pressure with automatic Sphygmomanometer. To determine the difference of resting heart rate and diastolic blood pressure among hockey players analysis of covariance (ANCOVA) test was employed and the significant level was set at 0.05. The result of the data indicated that there was no significant difference on respiratory rate, heart rate and blood pressure between active and passive recovery among hockey players.*

***Key words:*** *Active recovery, Passive Recovery, physiological variables, Blood pressure.*

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**Introduction:** Field hockey is an invasive territorial game that involves considerable aerobic energy contribution superimposed with brief though frequent anaerobic efforts. The Competition

requires players to sustain 70 min of high intensity intermittent exercise during which they have been reported to undergone quite rapid and radical change at a high percentage. As we know 70% of field hockey is aerobic & 30% is anaerobic, Stick skills and semi-crouched running with stick increases energy expenditure. Athletes participating in competitive sports particularly at elite level are frequently exposed to exhausting training sessions two or three times a day. Failure to appropriately recover after intense training sessions may result in physiological and psychological stresses and consequently impairs performance and increases the risk of injury. Appropriate recovery after exercise decreases fatigue, accelerates the rate of physiological and psychological regeneration and improves fitness levels. Recovery can therefore be considered as a significant component of athletic training and performance (Ebrahim E. et. al.2013) Excessive volumes of intense exercise, particularly with inadequate recovery, can place great physiological demands on the nervous, immune, metabolic systems and musculoskeletal, potentially causing a negative effect on training and competition in professional athletes (Reilly T et. al.2005**)** and predispose some players to overload injuries ( Barnett B, 2006), especially during a congested fixture period where players are required to compete and train repeatedly within a short time frame (Dupont G et.al 2010, Rey E et. al. 2010).Therefore the capacity to recover from intense exercise considered an important determinant of subsequent performance (Odetoyinbo K et.al.2009**)**. To facilitate the recovery, different post-exercise recovery modes have been suggested, classified into two categories (Bompa, 1999): (1) active (2) passive recovery. Active recovery may include submaximal physical activity and stretching training. In practice, active recovery strategies are used for the purposes of enhancing recovery during cool down protocols both after training and competition in professional athletes (Dadebo B et. al. 2004).

**Objectives of the Study:** The objectives of the study are as follows: To compare the effect of active and passive recovery on heart rate among hockey players. To compare the effect of active and passive recovery on systolic and diastolic blood pressure among hockey players.

**Research Hypothesis:** There would be significant difference between the mean score of active and passive recovery group on the selected physiological variables prior to and after the implementation of recovery interventions.

## RESEARCH PROCEDURE

**Sample of the Study:** The main purpose of the research was to compare the effect of active and passive recovery on physiological variables among hockey players. Ten male students from

hockey match practice group, who represented Lakshmibai National Institute of Physical Education Gwalior, in Inter-University competition, were randomly selected as subjects for this study. According to college health records their age range was between 18 –

23 years. The details are presented in the table1:-

**Table 1**

| S. No. | Group | No. of Participants |
|---|---|---|
| 1 | Active Group | 5 |
| 2 | Passive Group | 5 |
| **Total Number of Participants** | | **10** |

**Variables:**

**Dependent Variable:**

1. Heart rate.
2. Respiratory rate.
3. Systolic blood pressure.
4. Diastolic blood pressure.

**Independent Variable:**

Two recovery interventions are as follows.

1. Active recovery
2. Passive recovery

**Procedure of Data Collection:** In order to acquaint the subjects with the purpose of research being conducted, all the subjects were assembled on the synthetic hockey field of L.N.I.P.E Gwalior (M.P). The data on the physiological response variables was collected on the hockey field of L.N.I.P.E Gwalior. Pre data for Heart rate, respiratory rate and blood pressure were recorded just after the high intensive hockey match. As per the design of the study, after the pre-data subjects were randomly assigned in active recovery (n=5) and passive recovery (n=5) groups. The passive recovery group subjects were asked to lie down in supine lying position and active recovery group subjects were asked to perform selected stretching exercises. For active recovery the following sequence of exercise for 10 minutes was administered keeping in the mind that stretch the major muscles involves in play-

Slow jogging.

Breathing exercise/ deep breathing.

Slow jumping and bending.



**Figure 1. Automatic Sphygmomanometer is used to Measurement of the Blood Pressure and Heart Rate.**

Shaking of arms and legs.

Shoulder stretching.

Holding the both the hand at the back and stretch.

Elbow stretching.

Dancers stretch.

Sharpa asana.

Hamstring stretching.

Quadriceps stretching.

Calf stretching.

The researcher administered and trained one colleague with active recovery exercise regimen. The trained colleague served as a role model to all subjects and followed him. Pre- data of all the three variables was recorded just after the high intensity match; subsequently post data for selected variables were taken just after the treatment (10 min). The respiratory rate was measured by placing the hand just below the thoracic cavity that is on the diaphragm in breath/minute; Automatic Sphygmomanometer was used to measurement of the blood Pressure in mmHg and heart rate was measured with heart rate monitor in beat/ minutes (Figure 1).

**Statistical Technique:** Statistical analysis was done with SPSS (Statistical Package for the Social Sciences, 20.0, USA). Mean and standard deviation was calculated as a descriptive statistics and to compare the effect of active and passive recovery on selected physiological variables, Analysis of Covariance (ANCOVA) was employed and the level of significance was set at 0.05 level of confidence.

**Research Design:** The pre-test post-test randomized group design was adopted to find out the effect of active and passive recovery method on selected physiological variables after 70 minutes hockey match.

## RESULTS

**Table 2**

**Descriptive Statistics & Adjusted Mean Score of Active and Passive Recovery Groups for Heart Rate**

| Groups | Pre mean &SD | Post mean & SD | Adjusted mean |
|---|---|---|---|
| Active Group | 99.6 ± 6.97 | 81.80 ± 6.58 | 82.19 |
| Passive Group | 100.6 ± 4.30 | 85.20 ± 5.97 | 84.81 |

Table 2 shows descriptive statistics & adjusted mean scores after eliminating the effect of covariate of active & passive groups. In active recovery group the pre mean & post mean along with standard deviation was 99.6 ± 6.97 & 81.8 ± 6.58. Similarly passive recovery group pre mean & post mean along with standard deviation was 100.6 ± 4.30 & 85.2 ± 5.97. The adjusted mean score of active recovery group was 82.19 and adjusted mean score of passive recovery group was 84.81. The mean and adjusted mean scores are illustrated in Figure 2.

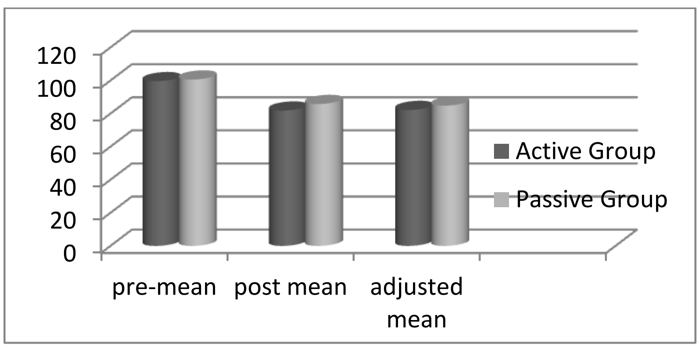



**Figure 2. Mean and Adjusted Mean of Heart Rate for Active and Passive Recovery Group**

**Table 3: Analysis of Co-Variance**

| SV | SS | df | MSS | F Value |
|---|---|---|---|---|
| Treatment | 16.977 | 1 | 16.98 | .661 |
| Error | 179 | 7 | 25.68 | |

*** Significant at .05 level, F.05 (1, 7) = 5.59**

Table 3 reveals that the effect of active recovery on the heart rate among L.N.I.P.E hockey match practice was not significant at 0.05 levels as the obtained F-value of 0.661 was less than the required F-value of 5.59.

**Table 4: Descriptive Statistics & Adjusted Mean score of Active and Passive Recovery Groups for Respiratory Rate**

| Groups | Pre mean & SD | Post mean & SD | Adjusted mean |
|---|---|---|---|
| Active Group | 39.6 ± 4.63 | 29.2 ± 2.04 | 28.63 |
| Passive Group | 42.4 ± 4.96 | 29.4 ± 5.04 | 29.96 |

Table 4 shows the descriptive statistics & adjusted mean scores after eliminating the effect of covariate of active & passive recovery groups. In active recovery group pre mean & post mean along with standard deviation was 39.6 ± 4.63 & 29.2 ± 2.04. Similarly passive recovery group pre mean & post mean along with standard deviation was 42.4 ± 4.96 & 29.4 ± 5.04 The adjusted mean score of active recovery group was 28.63 and adjusted mean score of passive recovery group was 29. The mean and adjusted mean scores are illustrated in Figure 3.

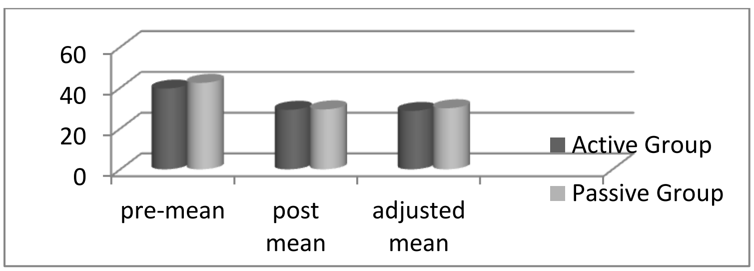



**Figure 3. Mean and Adjusted Mean Score of Respiratory Rate for Active and Passive Recovery Groups**

**Table 5: Analysis of Co-Variance**

| SV | SS | df | MSS | F Value |
|---|---|---|---|---|
| Treatment | 4.053 | 1 | 4.053 | .357 |
| Error | 79.531 | 7 | 11.362 | |

***Significant at .05 level, F.05 (1, 7) = 5.59**

Table 5 reveals that the effect of active recovery on the heart rate among L.N.I.P.E hockey match practice was not significant at 0.05 levels as the obtained value F-value of 0.357 was less than the required F-value of 5.59.

**Table 6: Descriptive Statistics & Adjusted Mean Score of Active and Passive Recovery Group for Systolic Blood Pressure**

| Groups | Pre mean & SD | Post mean & SD | Adjusted mean |
|---|---|---|---|
| Active Group | 139.2 ± 4.91 | 118.6 ± 4.31 | 120.30 |
| Passive Group | 146.2 ± 13.10 | 123.6 ± 10.19 | 121.90 |

Table 6 shows the descriptive statistics & adjusted mean scores after eliminating the effect of covariate of active & passive recovery groups. In active group pre mean & post mean along with standard deviation was 139.2 ± 4.915 & 118.6 ± 4.317. Similarly passive recovery group pre mean & post mean along with standard deviation was 146.2 ± 13.106 & 123.6 ± 10.19. Adjusted mean score of active recovery group was 120.30 and adjusted mean score of passive recovery group was 121.90. The mean and adjusted mean scores are illustrated in Figure 4.

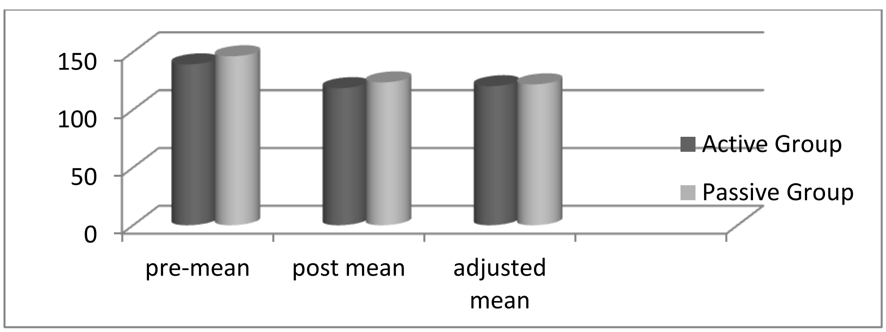



**Figure 4. Mean and Adjusted Mean of Systolic Blood Pressure for Active and Passive Recovery Groups**

**Table 7: Analysis of Co-Variance**

| SV | SS | df | MSS | F Value |
|---|---|---|---|---|
| Treatment | 5.689 | 1 | 5.689 | .104 |
| Error | 381.300 | 7 | 54.471 | |

***Significant at .05 level, F.05 (1, 7) = 5.59**

Table 7 reveals that the effect of active recovery on the systolic blood pressure among L.N.I.P.E hockey match practice was not significant at 0.05 levels as the obtained F-value of 0.104 was less than the required F-value of 5.59.

Table 8 shows the descriptive statistics & the adjusted mean scores after eliminating the effect of covariate of active & passive recovery groups. In active recovery group pre mean & post mean along with standard deviation was 81.6 ± 2.64 & 73 ± 3.033. Similarly passive recovery group pre mean & post mean along with standard deviation was 88.6 ± 7.282 & 79 ± 6.228. The adjusted mean score of active recovery group was 75.967 and adjusted mean score passive recovery group was 76.033.

**Table 8: Descriptive Statistics & Adjusted Mean Score of Active and Passive Group for Diastolic Blood Pressure**

| Groups | Pre mean & SD | Post mean & SD | Adjusted mean |
|---|---|---|---|
| Active Group | 81.6 ± 2.64 | 73 ± 3.033 | 75.967 |
| Passive Group | 88.6 ± 7.282 | 79 ± 6.228 | 76.033 |

The mean and adjusted mean scores are illustrated in Figure 5.

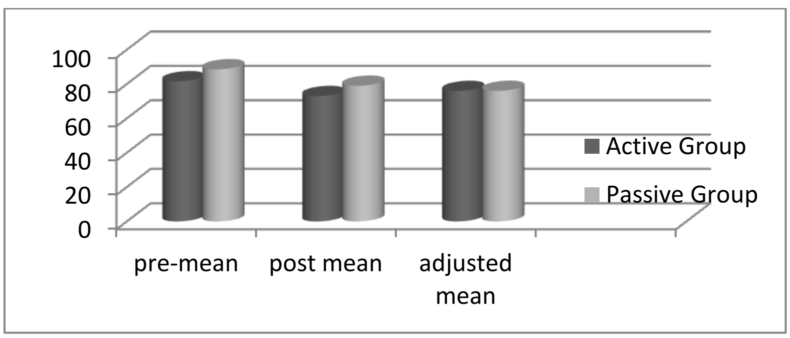



**Figure 5. Mean and Adjusted Mean Scores of Diastolic Blood Pressure for Active and Passive Recovery Groups**

**Table 9: Analysis of Co-Variance**

| SV | SS | df | MSS | F Value |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| Treatment | .008 | 1 | .008 | .001 |
| Error | 39.943 | 7 | 5.706 | |

***Significant at .05 level, F.05 (1, 7) = 5.59**

Table 9 reveals that the effect of active recovery on the systolic blood pressure among L.N.I.P.E hockey match practice was not significant at 0.05 levels as the obtained F-value of 0.001 was less than the required F-value of 5.59.

**Conclusion:** The ultimate aim of the study was to investigate the immediate effect of post training active (low intensity running and static stretching) and passive recovery interventions (supine lying position) on heart rate, respiratory rate and blood pressure (systolic and diastolic blood pressure) values in male hockey players and the findings provided the following information: There was no significant differences between active and passive recovery intervention on selected physiological variables namely heart rate, respiratory rate and blood pressure among the Inter-university hockey players. The reason behind the insignificant difference between active and passive group may be due to the fact that cardiorespiratory activity is controlled by a network of neurons located within the lower brainstem (Autonomic nervous system), activity of brainstem cardiorespiratory circuitry is controlled by inputs originating from higher centers of the brain as well as from various peripheral afferents, including cardiovascular and respiratory chemoreceptors and baroreceptors (sensory afferent nerve endings located in the carotid sinus and the aortic arch) so autonomic nervous system recognized as a key factor in lowering the heart rate, respiratory rate and blood pressure with the help of sympathetic and parasympathetic nervous system during recovery, this is the natural phenomenon which takes time to settle individually and was not in control of scholar. As discussion of the finding it was concluded that both the recovery interventions provide similar recovery and this result was research results were consistent with Ebrahim Khoshnam et al. (2013,) Guru et al (2013), Shelle Lau et al. (2001) and Rey E. et al. (2012).

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